4-1-1992

An Analysis of the Effects of a Readjustment of the Math Placement Test Cutoff Scores

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April, 1992

Introduction

In May, 1991, the Office of Institutional Assessment and Testing (OIAT) published a report that summarized analyses conducted to explore the relationship of the three levels of the Math Placement Test (MPT)--Basic Algebra, Intermediate Algebra, and Pre-Calculus--with mathematics course selection and final mathematics course grade. Based on the MPT score, the probability of receiving a passing grade (C- or better) was computed for the majority of mathematics courses that a student may enroll in immediately after taking the MPT. Partly as a result of that report, in the fall, 1991, cut-off scores for admittance to certain mathematics courses were readjusted to more appropriately reflect the needs and abilities of students at WWU.

This report will follow-up that earlier analysis in order to assay the effectiveness of those new MPT cut-off scores. Again, the probability of receiving a passing grade (C- or better) will be computed; however, unlike that first report, this year's sample will include only Native students who enrolled in the Fall of 1991. By default, these are students who have both taken the MPT and enrolled in a mathematics course since the MPT score readjustment. Students fitting the criteria produced a sample size of 822; however, a first analysis of the data revealed some irregularities. Consequently, students who had dropped out of the course were dropped from the sample. It is possible that some of the students may have been failing the course; there could just as well be any number of other reasons for dropping. Ultimately, there was no way to satisfactorily account for them; hence, all samples in this report will consist of students who completed the mathematics courses. The elimination of those students who dropped out generated a final, usable sample size of 737.

Probability of Receiving a Passing Grade

Intermediate Algebra Test

Of the 737 students in the overall sample, 398 took the Intermediate Algebra Test. Students' test scores ranged from 8 to 44, with an average score of 21.81. A majority of these students, 57.5%, enrolled in Math 102.

The following list describes the percentage of students who passed (C- or better) the mathematics course enrolled in after taking the Intermediate Algebra MPT:

- Math 102: 89.3% completing the course passed;
- Math 103, 88.5% completing the course passed;
- Math 104, 95.5% completing the course passed;

- Math 105, 95.0% completing the course passed;
- Math 155, 71.8% completing the course passed.

Students with Intermediate Algebra MPT test scores under the allowed cut-off points for entrance into a given mathematics course were still managing to enroll in those courses, although in less frequencies than in the previous report. Twenty Intermediate Algebra MPT takers were enrolled in courses for which their MPT scores were under the cut-off points. In these cases, fourteen passed the course enrolled in, while six failed to pass the course.

Precalculus Test

Of the 737 students in the overall sample, 336 took the Precalculus Test. Students' test scores ranged from 4 to 40, with an average score of 23.99. The course most frequently enrolled in by these students was Math 124 at 33.6%. (See Tables 1 and 2 for the complete listing of course enrollments.)

The following list describes the percentage of students who passed (C- or better) the mathematics course enrolled in after taking the Precalculus MPT:

- Math 102, 93.3% completing the course passed;
- Math 103, 94.6% completing the course passed;
- Math 104, 97.0% completing the course passed;
- Math 105, 93.9% completing the course passed;
- Math 124, 89.0% completing the course passed;
- Math 128, 100% completing the course passed;
- Math 155, 85.4% completing the course passed;
- Math 157, 92.3% completing the course passed.

Students with Precalculus MPT test scores under the allowed cut-off points for entrance into a given mathematics course were still managing to enroll in those courses, although in less frequencies than in the previous report. Only four Precalculus MPT takers were enrolled in courses for which their MPT scores were under the cut-off points, and in all but one case the students passed the course. (See Tables 3 and 4 for drop-out rate for takers of both Intermediate Algebra and Precalculus Tests.)

TABLE 1: Mathematics course enrolled in after taking Intermediate Algebra Math Placement Test (pre-drop outs)

Course	Frequency	Percentage
Math 102: Intermediate Algebra	257	57.5
Math 103: College Algebra	59	13.2
Math 104: Trigonometry	30	6.7
Math 105: Pre-calculus	47	10.5
Math 155: Algebra w/application to Bus/Econ	53	11.9
Math 281: Math in Grades K-8	1	0.2

TABLE 2: Mathematics Course Enrolled in after taking Precalculus Math Placement Test (pre-drop outs)

Course	Frequency	Percentage
Math 102: Intermediate Algebra	15	4.0
Math 103: College Algebra	40	10.8
Math 104: Trigonometry	35	9.4
Math 105: Pre-calculus	74	19.9
Math 124: Calculus & Analytic Geometry	125	33.6
Math 128: Accelerated Calculus	8	2.2
Math 155: Algebra w/application to Bus/Econ	47	12.6
Math 157: Calc w/application to Bus/Econ	27	7.3
Math 281: Math in Grades K-8	1	0.3

TABLE 3: Completed or Dropped out of mathematics course after taking Intermediate Algebra Math Placement Test

Course	Completed		Dropped out	
	N	%	N	%
Math 102: Intermediate Algebra	244	94.9	13	5.1
Math 103: College Algebra	52	88.1	7	11.9
Math 104: Trigonometry	22	73.3	8	26.7
Math 105: Pre-calculus	40	85.1	7	14.9
Math 155: Algebra w/application to Bus/Econ	39	73.6	14	26.4
Math 281: Math in Grades K-8	1	100.0	-	-

TABLE 4: Completed or Dropped out of mathematics course after taking Precalculus Math Placement Test

Course	Completed		Dropped out	
	N	%	N	%
Math 102: Intermediate Algebra	15	100.0	-	-
Math 103: College Algebra	37	92.5	3	7.5
Math 104: Trigonometry	33	94.3	2	5.7
Math 105: Pre-calculus	66	89.2	8	10.8
Math 124: Calculus & Analytic Geometry	109	87.2	16	12.8
Math 128: Accelerated Calculus	8	100.0	-	-
Math 155: Algebra w/application to Bus/Econ	41	87.2	6	12.8
Math 157: Calc w/application to Bus/Econ	26	96.3	1	3.7
Math 281: Math in Grades K-8	1	100.0	-	-

Relationship of MPT score to Course Grade and Other Predictors of Academic Achievement

Overall

Correlations between MPT score, high school gpa (hsgpa), three pre-college quantitative test scores (WPCT-Q, SAT-Q, and ACT-Q), and the grade received in the mathematics course taken were analyzed by overall sample, and by individual course. In the overall sample, analysis showed that the WPCT-Q score was moderately positively correlated to grade received; that hsgpa, SAT-Q, and ACT-Q were mildly positively correlated to grade received, and that MPT score was slightly positively correlated to grade received.

Basic Algebra Test

Only three students in this sample took the Basic Algebra Test, which made reporting on its effectiveness somewhat difficult. Unlike the May, 1991, addendum report, which made a concerted effort to acquire a sample of Basic Algebra Test takers large enough to do accurate analyses, the current report, because of its stated intent, has not that flexibility but rather had to work with the limited numbers available within its mandate.

Intermediate Algebra Test

Correlation analyses between students who took the Intermediate Algebra Test and the mathematics courses they enrolled in were performed by overall sample, and by individual course. After eliminating indicators that were not statistically significant, the following observations were generated:

- by overall sample, the ACT-Q test had a moderately positive relationship with grade received; the SAT-Q, high school gpa, and MPT score had a mildly positive relationship with grade received;

- by Math 102 course only, the MPT score and SAT-Q had mildly positive relationships with grade received;

- by Math 103 course only, high school GPA and SAT-Q had mildly positive relationship with grade received;

- by Math 104 and Math 105 courses only, high school GPA had a mildly positive relationship to grade received;

- by Math 155 course only, SAT-Q had a moderately positive relationship to grade received; high school GPA had a mildly positive relationship.

Precalculus Test

Correlational analyses between students who took the Precalculus Test and the mathematics courses they enrolled in were performed by overall sample, and by individual course. After eliminating indicators that were not statistically significant, the following observations were found:

- by overall sample, high school gpa had a mildly positive relationship to grade received;

- by Math 102 course only, no indicators were statistically significant, due to low frequency count;

- by Math 103 course only, high school GPA had a moderately positive relationship to grade received;

- by Math 104 course only, high school GPA had a mildly positive relationship to grade received;

- by Math 105 course only, high school GPA had a moderately positive relationship to grade received; SAT-Q and MPT score had mildly positive relationships;

- by Math 124 course only, MPT score had a mildly positive relationship to grade received;

- by Math 128 course only, no indicators were statistically significant, due to low frequency count;

- by Math 155, high school GPA had a mildly positive relationship to grade received;

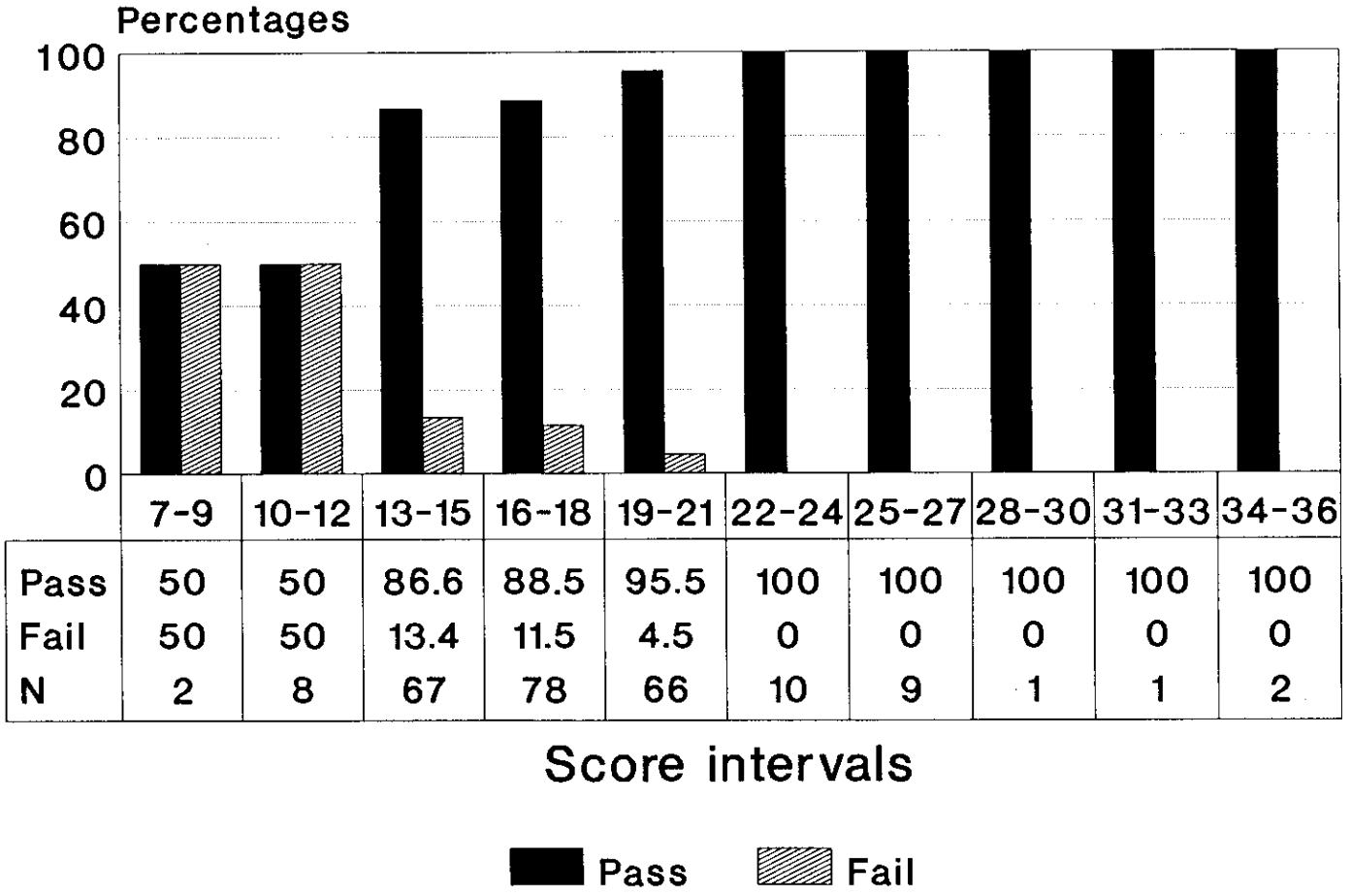
- by Math 157, high school GPA had a moderately positive relationship to grade received; MPT score had a mildly positive relationship to grade received.

The results suggest that the predictors of grade received in a mathematics course followed an inconsistent pattern. The only indicator that maintained both statistical significance and a positive correlation, however mild, throughout nearly all the analyses was high school GPA. This may result from the fact that hsgpa always had enough frequencies to permit appropriate analysis. In addition, the usefulness of many positively correlated indicators was often undermined by low frequencies.

Gender Analysis of Selected Data

Statistical analysis of pass/fail rate between females and males, as well as grade earned in mathematics course taken between females and males indicated no statistical significance in either area. Males and females passed and failed mathematics courses at similar rates, as well as earned similar grades.

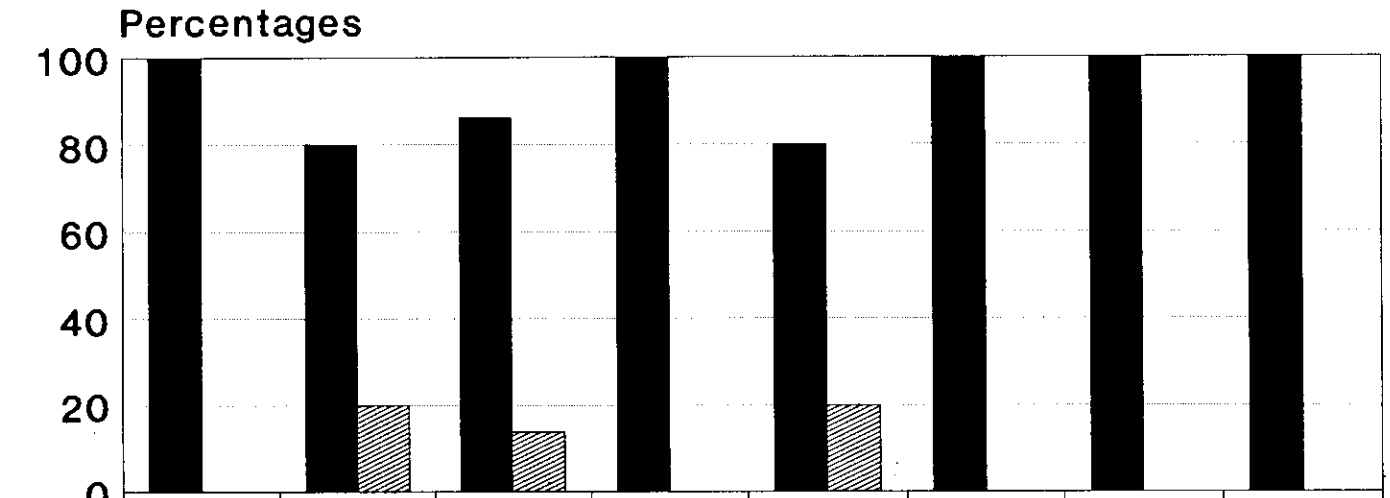
FIGURE 1 : INTERMEDIATE ALGEBRA - 1991
Test score intervals and course # 102



	7-9	10-12	13-15	16-18	19-21	22-24	25-27	28-30	31-33	34-36
Pass	50	50	86.6	88.5	95.5	100	100	100	100	100
Fail	50	50	13.4	11.5	4.5	0	0	0	0	0
N	2	8	67	78	66	10	9	1	1	2

*current cut-off score is 13

FIGURE 2 : INTERMEDIATE ALGEBRA - 1991
Test score intervals and course # 103



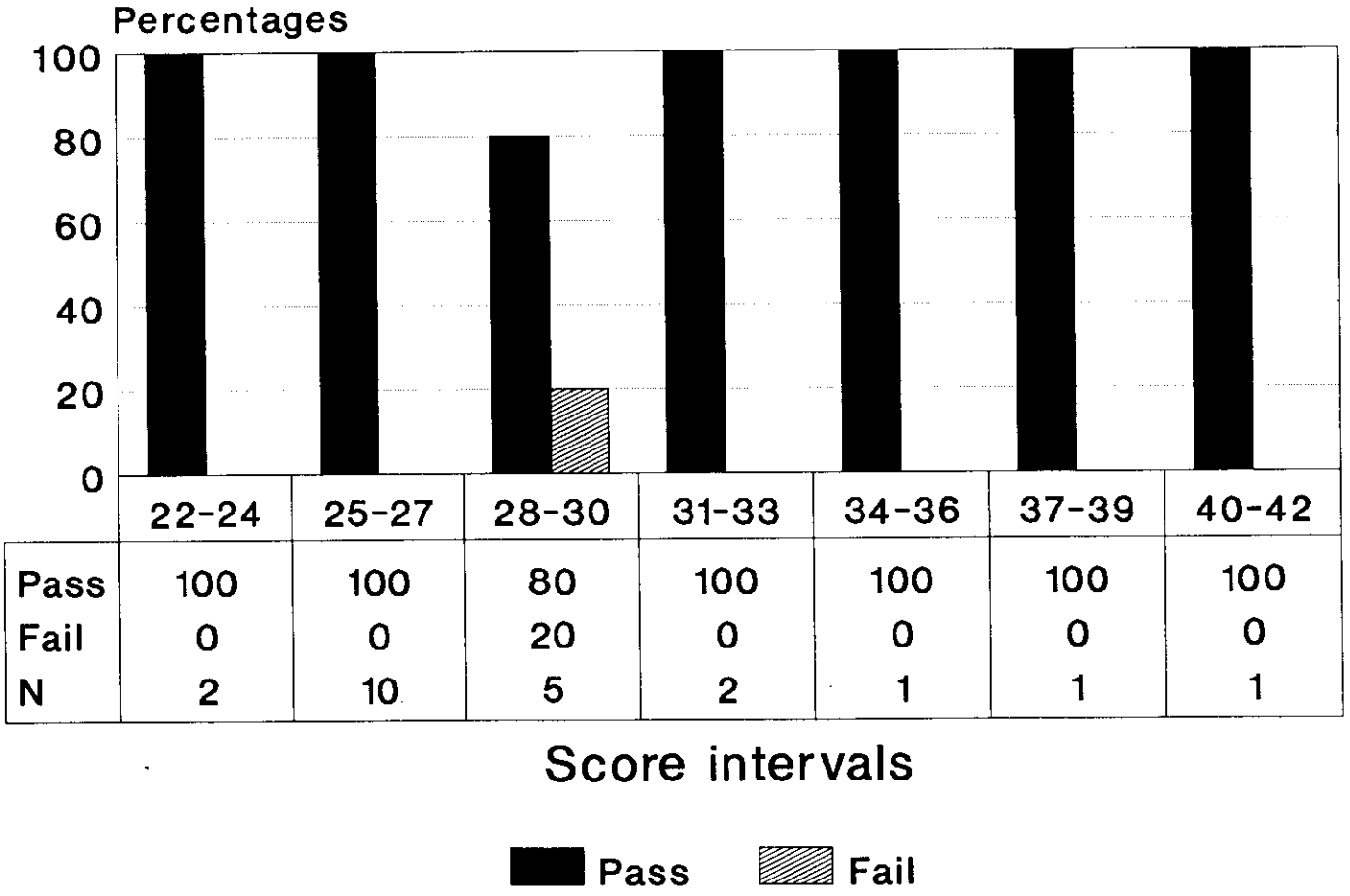
	16-18	19-21	22-24	25-27	28-30	31-33	37-39	43-45
Pass	100	80	86.2	100	80	100	100	100
Fail	0	20	13.8	0	20	0	0	0
N	1	5	29	4	5	6	1	1

Score intervals

Pass Fail

*current cut-off score is 22

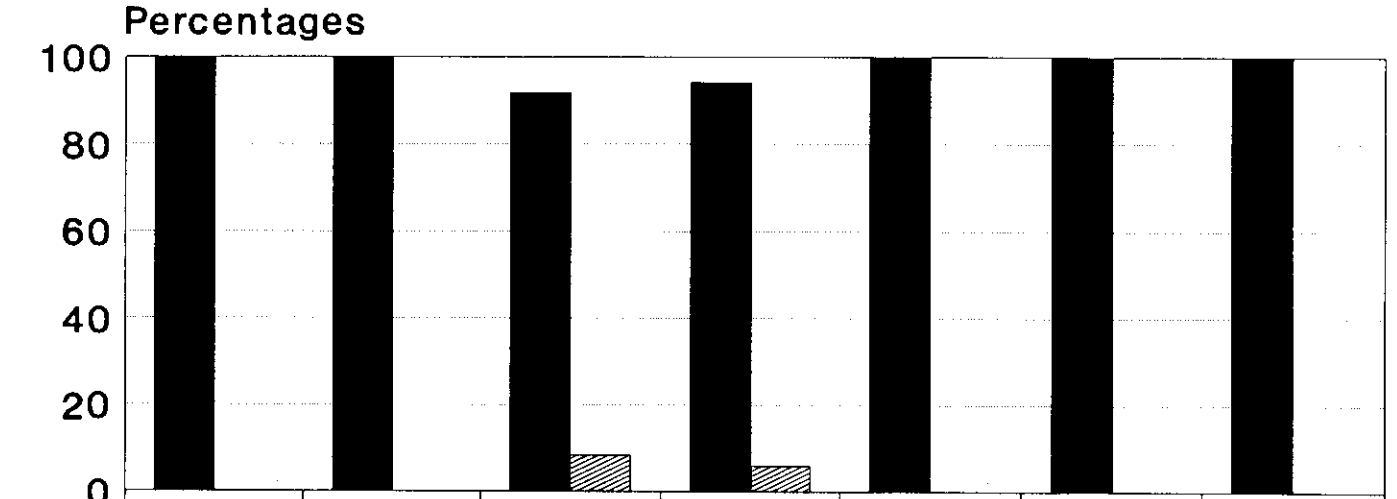
FIGURE 3 : INTERMEDIATE ALGEBRA - 1991
Test score intervals and course # 104



	22-24	25-27	28-30	31-33	34-36	37-39	40-42
Pass	100	100	80	100	100	100	100
Fail	0	0	20	0	0	0	0
N	2	10	5	2	1	1	1

*current cut-off score is 25

FIGURE 4 : INTERMEDIATE ALGEBRA - 1991
Test score intervals and course # 105



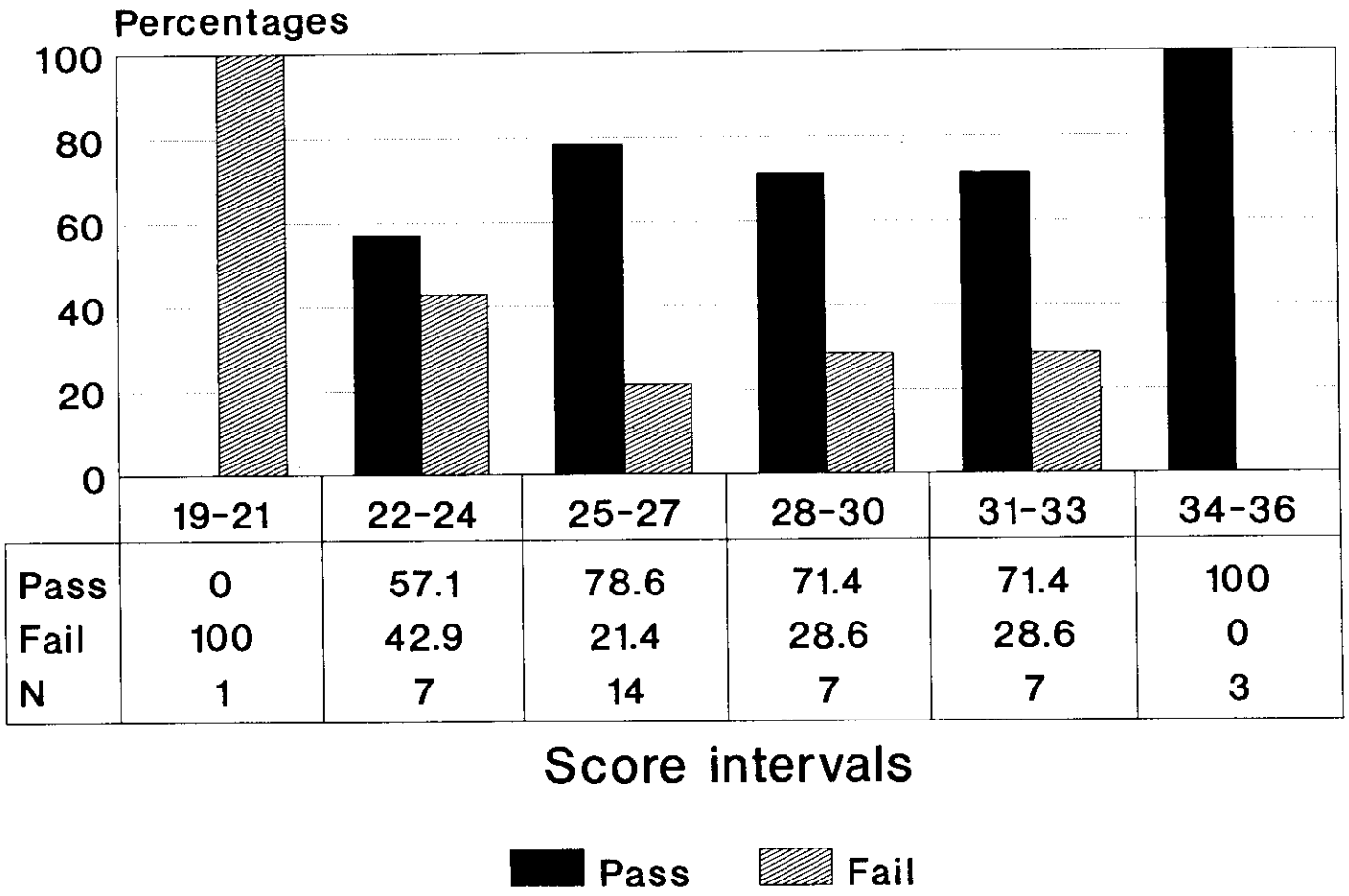
	19-21	25-27	28-30	31-33	34-36	37-39	40-42
Pass	100	100	91.7	94.1	100	100	100
Fail	0	0	8.3	5.9	0	0	0
N	1	1	12	17	1	4	4

Score intervals

Pass Fail

*current cut-off score is 28

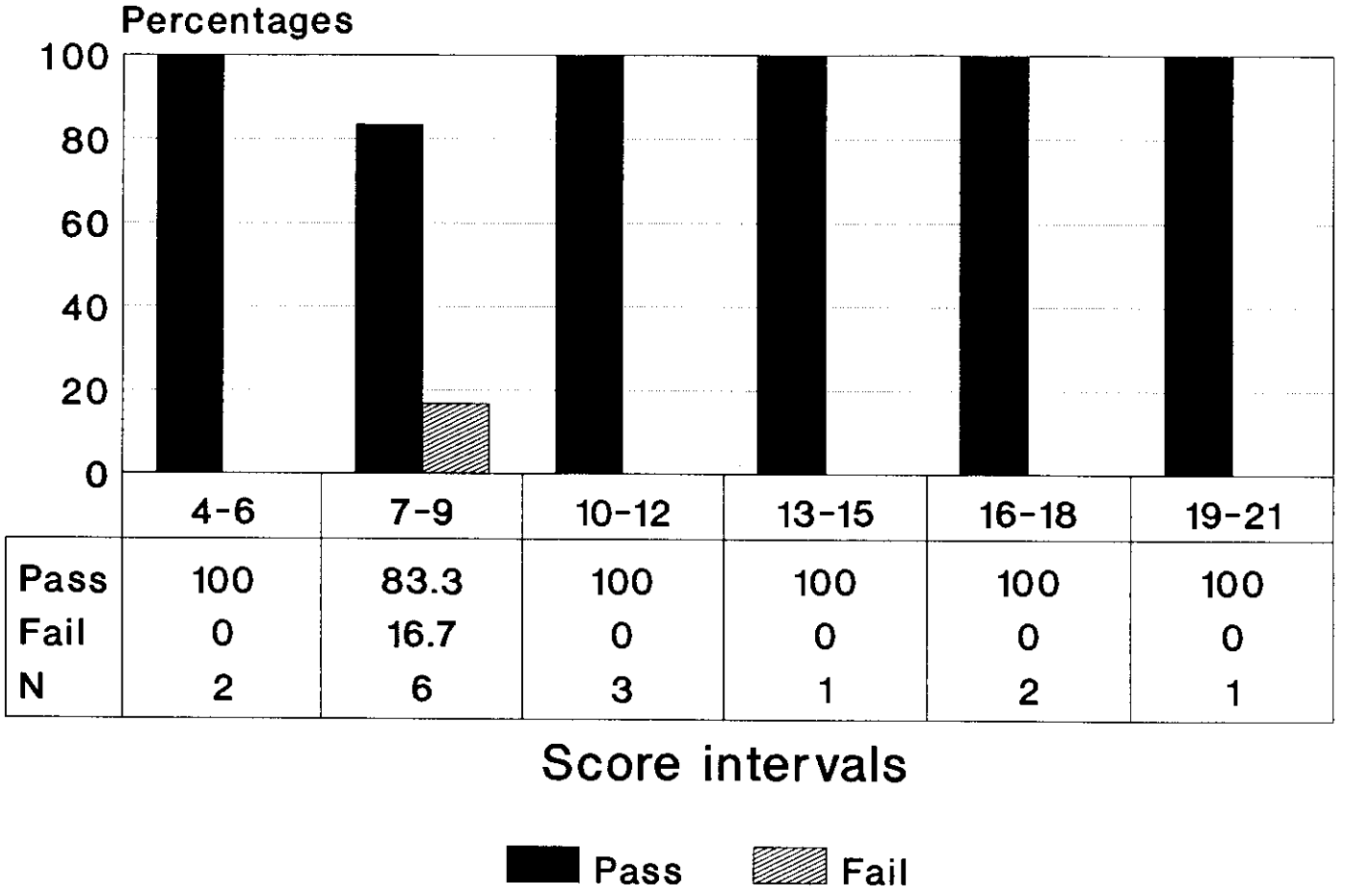
FIGURE 5 : INTERMEDIATE ALGEBRA - 1991
Test score intervals and course # 155



	19-21	22-24	25-27	28-30	31-33	34-36
Pass	0	57.1	78.6	71.4	71.4	100
Fail	100	42.9	21.4	28.6	28.6	0
N	1	7	14	7	7	3

*current cut-off score is 22

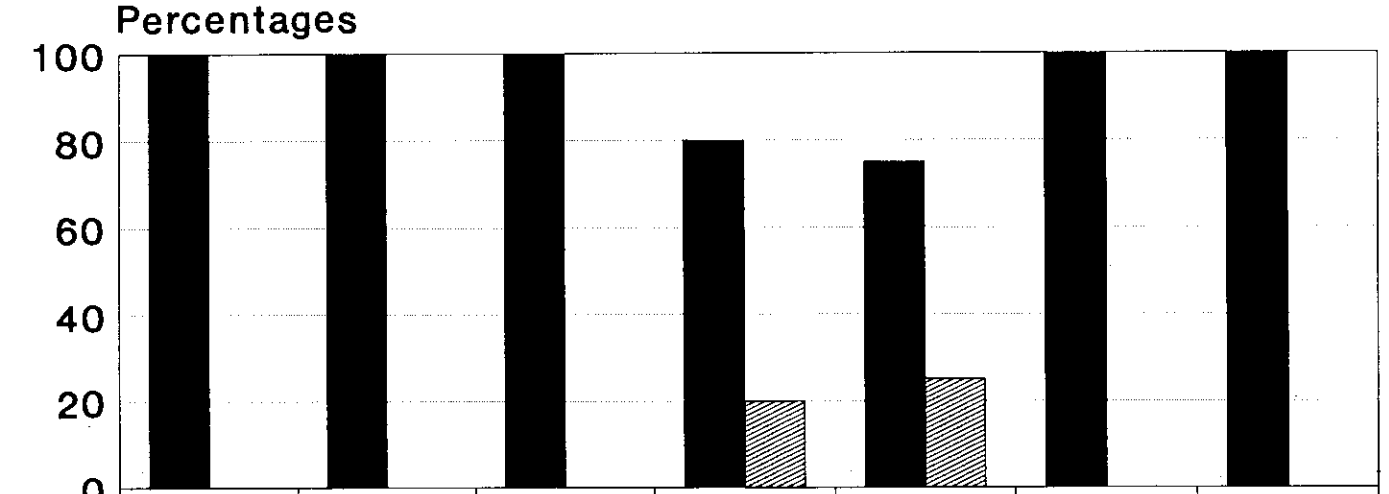
FIGURE 6 : PRE-CALCULUS TEST - 1991
Test score intervals and course # 102



	4-6	7-9	10-12	13-15	16-18	19-21
Pass	100	83.3	100	100	100	100
Fail	0	16.7	0	0	0	0
N	2	6	3	1	2	1

*current cut-off score is 4

FIGURE 7 : PRE-CALCULUS TEST - 1991
Test score intervals and course # 103



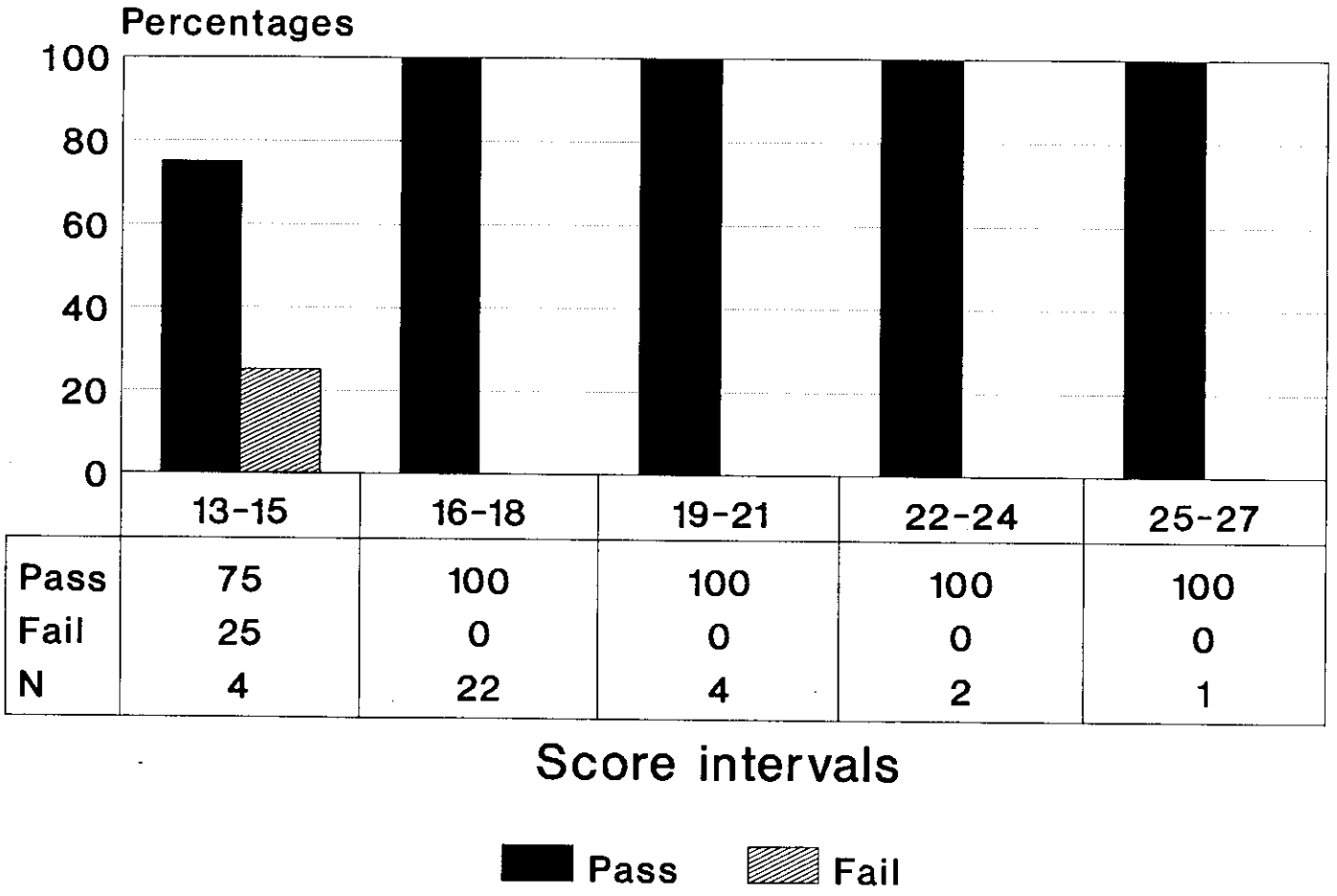
	7-9	10-12	13-15	16-18	19-21	22-24	25-27
Pass	100	100	100	80	75	100	100
Fail	0	0	0	20	25	0	0
N	1	9	14	5	4	3	1

Score intervals

Pass Fail

*current cut-off score is 10

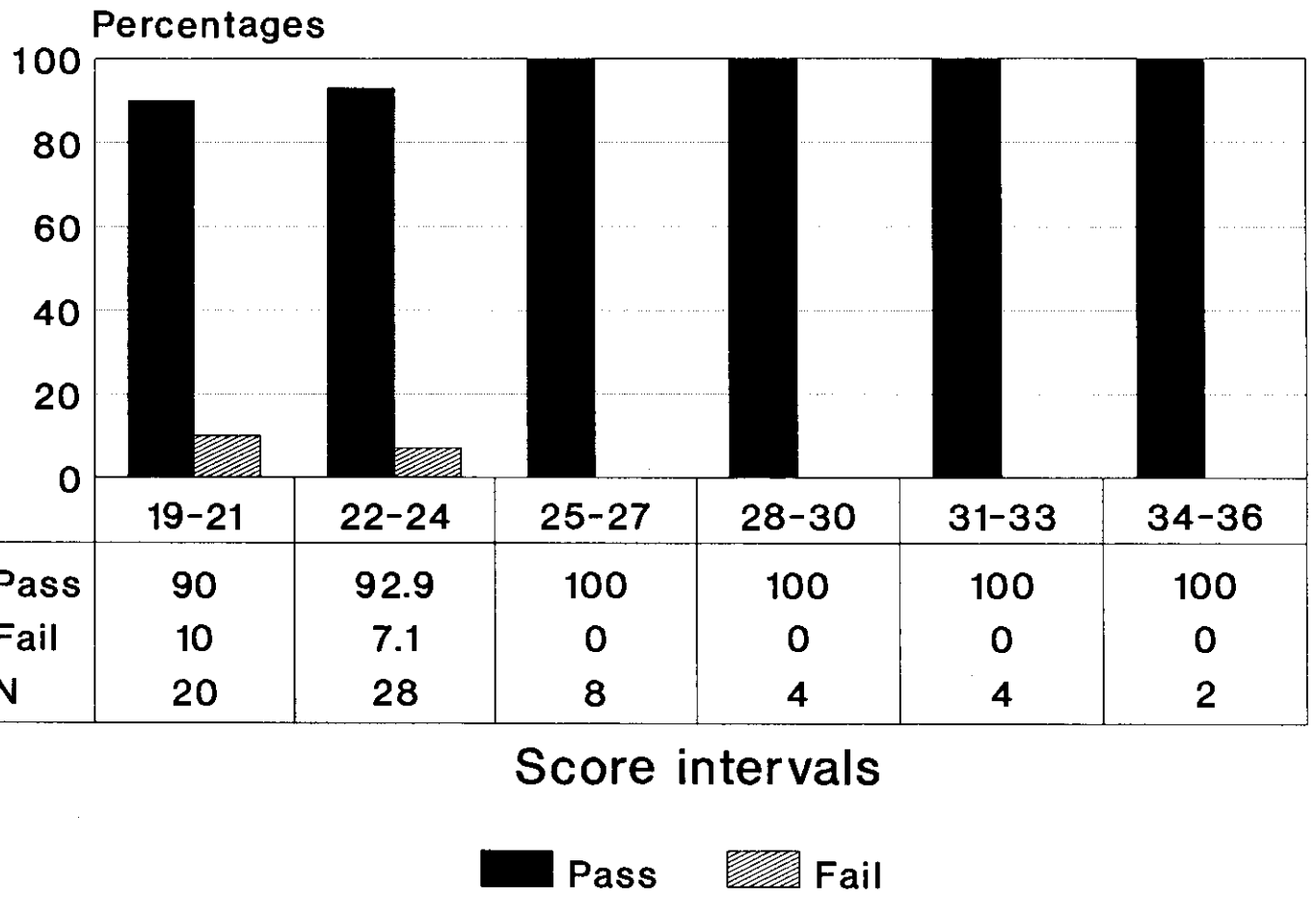
FIGURE 8 : PRE-CALCULUS TEST - 1991
Test score intervals and course # 104



	13-15	16-18	19-21	22-24	25-27
Pass	75	100	100	100	100
Fail	25	0	0	0	0
N	4	22	4	2	1

*current cut-off score is 15

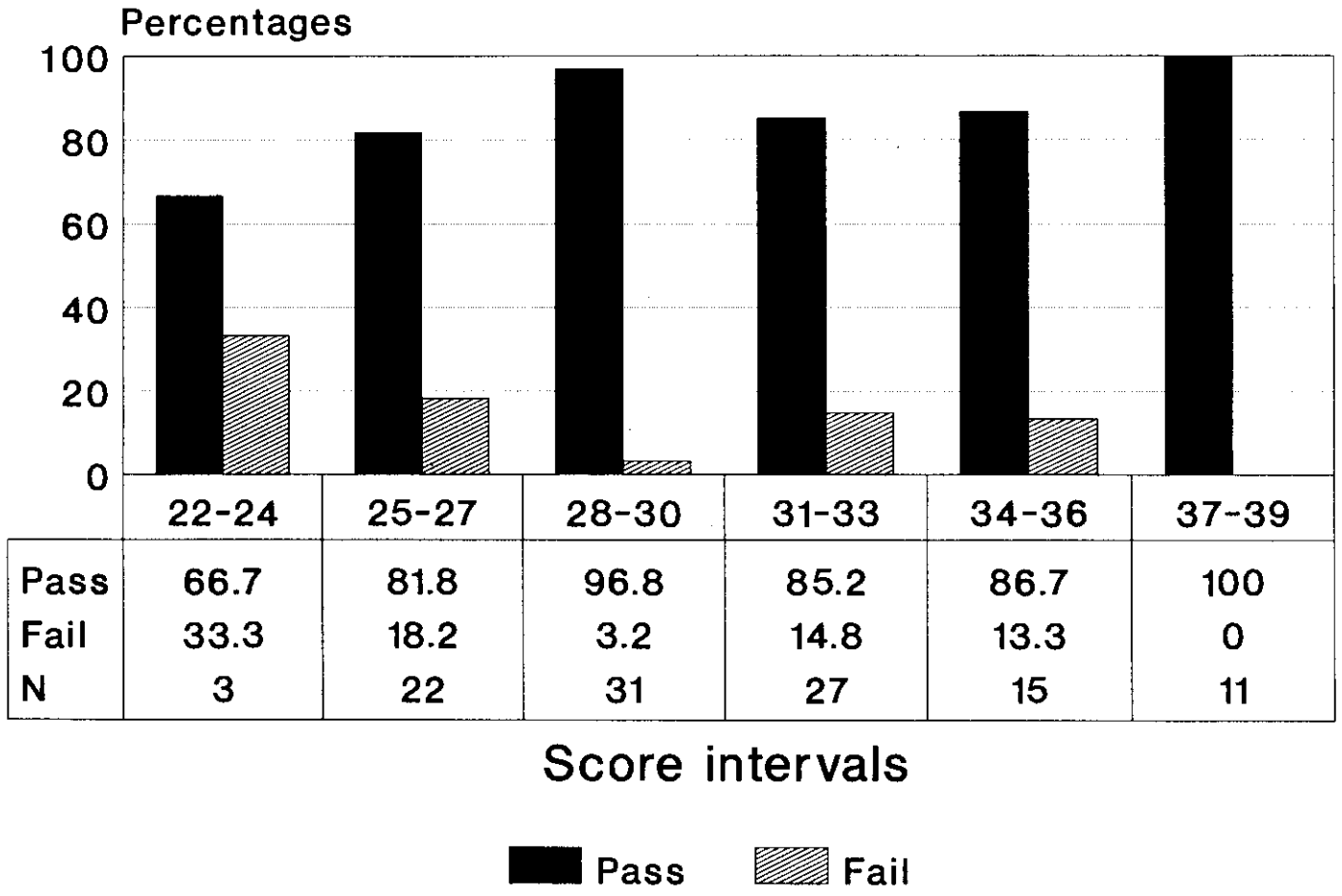
FIGURE 9 : PRE-CALCULUS TEST - 1991
Test score intervals and course # 105



	19-21	22-24	25-27	28-30	31-33	34-36
Pass	90	92.9	100	100	100	100
Fail	10	7.1	0	0	0	0
N	20	28	8	4	4	2

*current cut-off score is 19

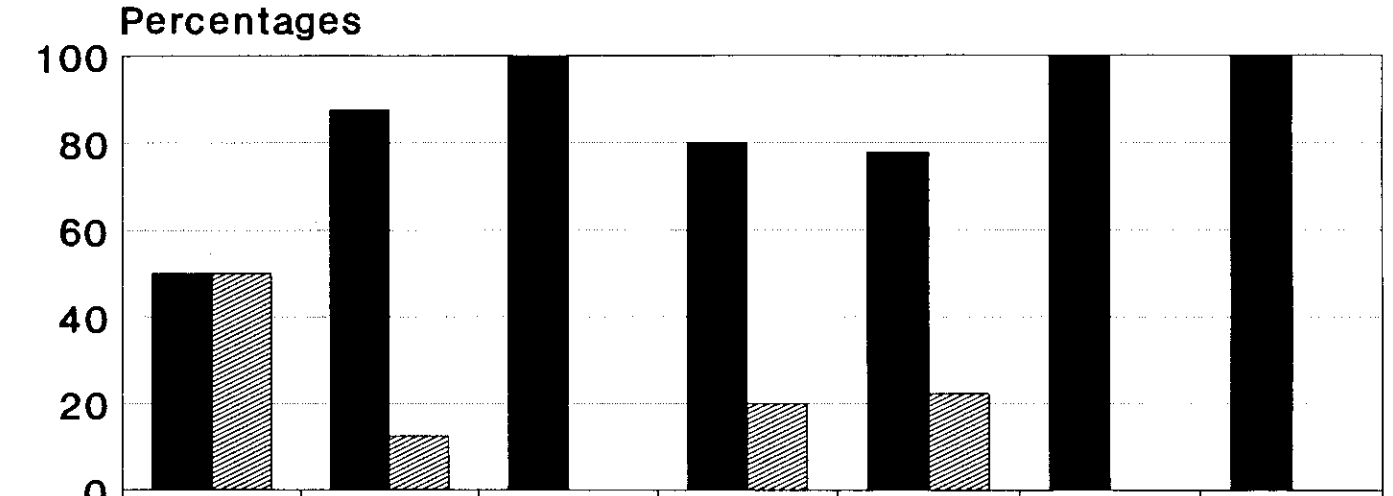
FIGURE 10 : PRE-CALCULUS TEST - 1991
Test score intervals and course # 124



	22-24	25-27	28-30	31-33	34-36	37-39
Pass	66.7	81.8	96.8	85.2	86.7	100
Fail	33.3	18.2	3.2	14.8	13.3	0
N	3	22	31	27	15	11

*current cut-off score is 25

FIGURE 11 : PRE-CALCULUS TEST - 1991
Test score intervals and course # 155



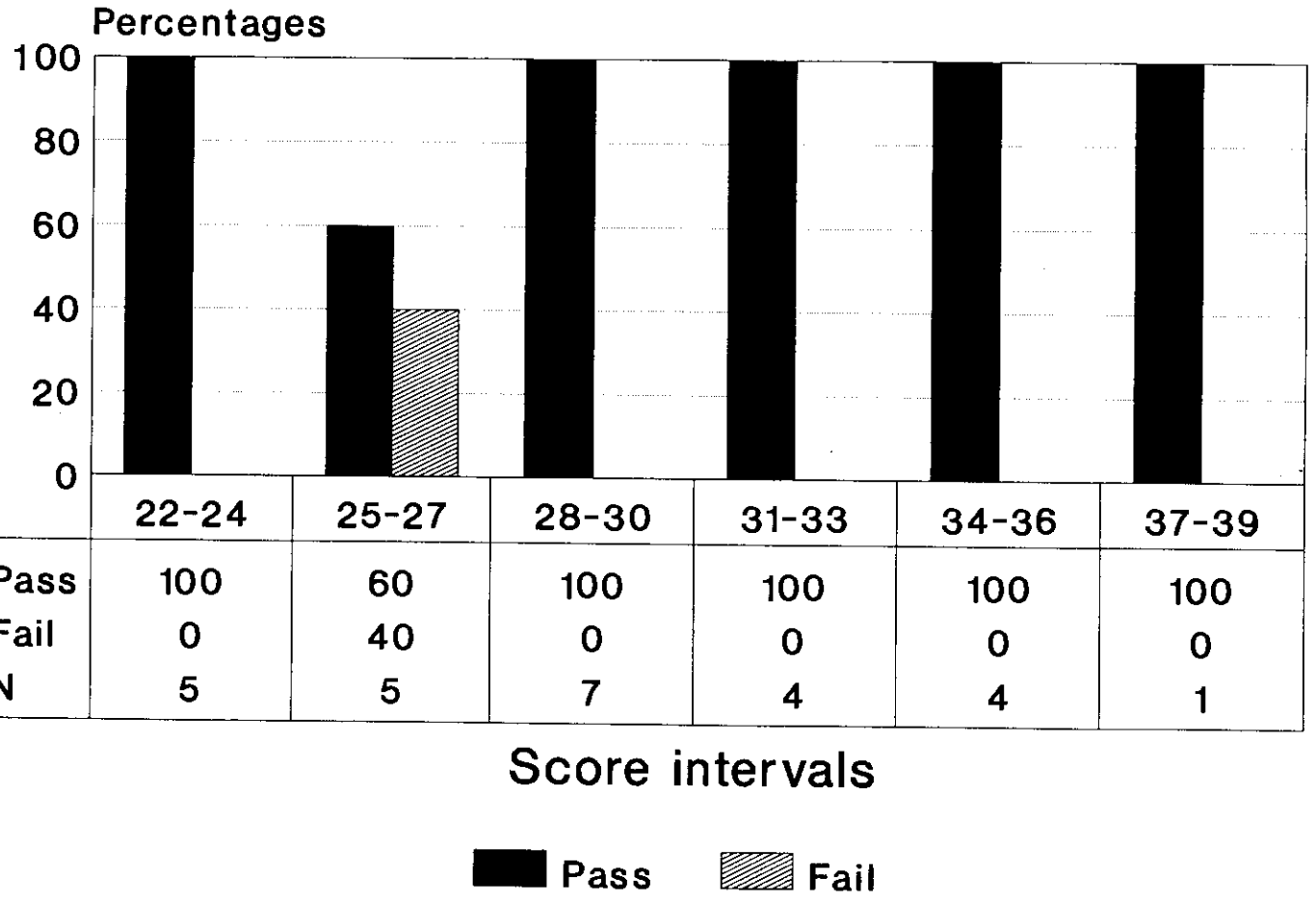
	10-12	13-15	16-18	19-21	22-24	25-27	28-30
Pass	50	87.5	100	80	77.8	100	100
Fail	50	12.5	0	20	22.2	0	0
N	2	8	8	10	9	3	1

Score intervals

Pass Fail

*current cut-off score is 10

FIGURE 12 : PRE-CALCULUS TEST - 1991
Test score intervals and course # 157



	22-24	25-27	28-30	31-33	34-36	37-39
Pass	100	60	100	100	100	100
Fail	0	40	0	0	0	0
N	5	5	7	4	4	1

*current cut-off score is 23